Rajgad Dnyanpeeth's

SHRI CHHATRAPATI SHIVAJIRAJE COLLEGE OF ENGINEERING

Gat No. 237, Pune Bangalore Highway, Dhangawadi, Tal – Bhor, Dist- Pune (Maharashtra)

Vision and Mission

❖ Vision

Excellent Institution for Education, Training and Research in Engineering.

❖ Mission

- Develop Competent Engineers along with professional skills and responsible citizens.
- Foster knowledge and technical skills of the highest standards to develop sustainable engineering solution
- Prepare engineers to respond to needs of the industry, higher studies and research through industry and institute interaction.

https://www.rajgad.org.in/

❖ Program Outcomes

PO1. Engineering Knowledge To apply knowledge of mathematics, science, engineering fundamentals, problem solving skills, algorithmic analysis to solve complex engineering problems.

PO2. Problem Analysis To analyze the problem by finding its domain and applying domain specific skills

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PO3. Development of Solutions To understand the design issues of the product/software and develop effective solutions with appropriate consideration of public health and safety, cultural, societal, and environmental issues.

PO4.Carrying out investigation of Complex Problems To find solutions of complex problems by conducting investigations applying suitable techniques.

PO5. Usage of Modern Tools To adapt the usage of modern tools and recent software.

PO6. Engineer and Society To contribute towards the society by understanding the impact of Engineering on global aspect.

PO7. Environment and Sustainability To understand environment issues and design a sustainable system.

PO8. Professional Ethics To understand and follow professional ethics.

PO9.Individudal and Team capability To function effectively as an individual and as member or leader in diverse teams and interdisciplinary settings.

PO10.Effective Communication To demonstrate effective communication at various levels.

PO11. Project Management To apply the knowledge for development of projects, and its finance and management.

PO12. Life Long Learning To keep in touch with current technologies and inculcate the practices of lifelong learning.

Program Spesific Outcomes (PSOs)

❖ Civil Engineering

PSO 1: The ability to create innovative designs with new materials of minimum embodied energy through research and development focusing on global quality of life by observing professional ethics.

PSO 2: The ability to recognize the need of the hour like housing, sanitation, transportation, waste management, irrigation, use of renewable energy etc. for a sustainable environment.

PSO 3: Function effectively in multi-disciplinary teams.

http://www.rajgad.org.in/dept_Civil.php

❖ Mechanical Engineering

PSO 1: Apply their knowledge in the domain of engineering Design, Production and Thermal fluid sciences to solve engineering problems utilizing advanced technology.

PSO 2: Successfully apply the principles of design, analysis and implementation of mechanical systems which have been learned as a part of the curriculum.

PSO 3: Develop and implement new ideas on product design and development with the help of modern CAD/CAM/CAE tools ensuring best practices.

http://www.rajgad.org.in/dept_Mechanical.php

❖ Electronics & Telecommunication Engineering

PSO 1: Should be able to understand the fundamental concepts in electronics circuit/ product design, networking techniques, IC design, embedded systems, and signal processing.

PSO 2: Should be able to apply the learning, analyze the communication systems with the help of hardware and software design tools..

PSO 3: Should be able to handle the project work and prepare engineering project module.

http://www.rajgad.org.in/dept_EnC.php

Computer Engineering

PSO1: Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying.

PSO2: Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

http://www.rajgad.org.in/dept_Computer.php

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Department of Electronics and Telecommunication

Course Outcomes (COs)

SE (Electronics and Telecommunication) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
204181	Signals and Systems	Understand mathematical description and representation of continuous and discrete
		Develop input output relationship for linear shift invariant system and understand the
		Understand and resolve the signals in frequency domain using Fourier series and Fourier
		Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event
204182	Electronic Devices and Circuits	Comply and verify parameters after exciting devices by any stated method.
		Implement circuit and test the performance
		Analyze small signal model of FET and MOSFET.
		Explain behavior of FET at low frequency.
		Design an adjustable voltage regulator circuits.
204183	Electrical Circuits and Machines	Analyze basic AC & DC circuit for voltage, current and power by using KVL, KCL,
		Explain the working principle of different electrical machines.
		Select proper electrical motor for given application
		Design and analyze transformers
204184	Data Structures and Algorithms	Discuss the computational efficiency of the principal algorithms such as sorting &
		Write and understand the programs that use arrays & pointers in C
		Describe how arrays, records, linked structures are represented in memory and use them in
		Implement stacks & queues for various applications
		Understand various terminologies and traversals of trees and use them for various
		Understand various terminologies and traversals of graphs and use them for various
204185	Digital Electronics	Use the basic logic gates and various reduction techniques of digital logic circuit in detail
		Design combinational and sequential circuits.
		Design and implement hardware circuit to test performance
		Understand the architecture and use of microcontrollers for basic operations and Simulate
204186	Electronic Measuring Instruments and Tools	Understand fundamental of various electrical measurements
		Understand describe specifications.features and capabilities of electronic instruments.
		Finilise specifications of instruments and select appropriate instruments for given
		Carry out required measurements using various instruments under different set up
		Able to compare measuring instruments for performance parameters.
		appropriate instruments for measurements for electrical parameter for professoinally.
207005	Engineering Mathematics III	Solve higher order linear differential equation using appropriate techniques for modeling
		Solve problems related to Fourier transform, Z-transform and applications to
		Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step
		Perform vector differentiation and integration, analyze the vector fields and apply to
		Analyze conformal mappings, transformations and perform contour integration of
204187	Integrated Circuits	Introduce basic building blocks of an operational Amplifier and identify closed loop
		Analyze, Design and Implement linear and non-linear applications of an op-amp.
		Distinguish, Formulate and demonstrate various converters using op-amp.
		Apply the functionalities of PLL to different applications and to memorize the concept of

04188	Control System	Determine and use models of physical systems in forms suitable for use in the analysis and
		Determine the (absolute) stability of a closed-loop control system.
		Perform time domain and frequency domain analysis of control systems required for
		Perform time domain and frequency domain correlation analysis.
		Apply root-locus, Frequency Plots technique to analyze control systems
		Express and solve system equations in state variable form.
04189	Analog Communication	Understand and identify the fundamental concepts and various components of
		Explain signal to noise ratio, noise figure and noise temperature for single and cascaded
		Describe analog pulse modulation techniques and digital modulation technique.
		Develop the ability to compare and contrast the strengths and weaknesses of various
04190	Object Oriented Programming	Understand the fundamentals of object oriented programming.
		Cover the concepts of data encapsulation, inheritance in C++.
		Understand basic program constructs in Java
		Discuss the concepts of classes, methods and inheritance to write programs Java.
		Describe arrays, vectors and strings concepts and interfaces to write programs in Java.
		Apply and use the concepts in Java to develop user friendly program,
04191	Employability Skill Development	Have skills and preparedness for aptitude tests
		Be equipped with essential communication skills (writing, verbal and non-verbal)
		Master the presentation skill and be ready for facing interviews.
		Build team and lead it for problem solving.

Course Outcomes (COs)

TE (Electronics and Telecommunication) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
304181	Digital Communication	Understand working of waveform coding techniques and analyse their performance.
		Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
		Perform the time and frequency domain analysis of the signals in a digital communication system.
		Design of digital communication system.
		Understand working of spread spectrum communication system and analyze its performance.
304182	Digital Signal Processing	Analyze the discrete time signals and system using different transform domain techniques.
		Design and implement LTI filters for filtering different real world signals.
		Develop different signal processing applications using DSP processor.
		Capable of calibrating and resolving different frequencies existing in any signal.
304183	Electromagnetics	Understand the basic mathematical concepts related to electromagnetic vector fields
		Apply the principles of electrostatics to the solutions of problems relating to electric field
		Apply the principles of magnetostatics to the solutions of problems relating to magnetic
		Understand the concepts related to Faraday's law, induced emf and Maxwell's equations
		Apply Maxwell's equations to solutions of problems relating to transmission lines and
304184	Microcontrollers	Learn importance of microcontroller in designing embedded application.
		Learn use of hardware and software tools.
		Develop interfacing to real world devices.
304185	Mechatronics	Identification of key elements of mechatronics system and its representation in terms of block diagram
		Understanding basic principal of Sensors and Transducer.
		Able to prepare case study of the system given.
		Understanding different electrical and mechanical Actuators.
		Explain linearization of nonlinear systems and elements of data acquisition.

		Explain various applications of design of mechatronic systems
304191	Signal Processing and Communications Lab	Understand working of waveform coding techniques and analyse their performance.
		Understand time and frequency domain analysis of line codes.
		Acquired knowledge about different M-ary modulation techniques.
		Understand the effect of random signal & noise on digital signals.
		Understand working of spread spectrum communication system and analyse its performance.
		Analyze the discrete time signals and system using different transform domain techniques & their properties. .
		Design and implement LTI filters for filtering different real world signals.
		Develop different signal processing applications using DSP processor.
		Analyse effect of different windowing function on filter response.
		Analyze effect of different sampling frequencies.
304192	Microcontrollers and Mechatronics Lab	Learn to program microcontroller using assembly language
		Learn to program microcontroller using embedded c language
		Learn to use different hardware and software tools to be used for different microcontroll
		Implement embedded systems for communication of peripherals with microcontroller
		Interface different peripherals with 8051 & PIC microcontroller
		Learn to implement real world embedded system application
		Learn to programme microcontroller using assembly language and embedded c language
		Learn to use different hardware and software tools to be used for different microcontroll
		Interface different peripherals with 8051 & PIC microcontroller.
		To develop a simulation model for simple physical systems and explain mechatronics design process.
		To design and implement data acquisition system.
		To design and implement various case studies of Mechatronics systems.
304193	Electronics System Design	Apply the fundamental concepts and working principles of electronics devices to design electronics systems
		Shall be able to interpret datasheets and thus select appropriate components and devices
		Select appropriate transducer and signal conditioning circuit to design prototype of Data Acquisition system.
		Design an electronic system/sub-system and validate its performance by simulating the same
		Shall be able to use an EDA tool for circuit schematic and simulation
		Create, manage the database and query handling using suitable tools.
304186	Power Electronics	Design & implement a triggering / gate drive circuit for a power device
		Understand, perform & analyze different controlled converters.
		Evaluate battery backup time & design a battery charger.
		Design & implement over voltage / over current protection circuit.
304187	Information Theory Coding and Communication Networks	Perform information theoretic analysis of communication system
		Design a data compression scheme using suitable source coding technique.
		Design a channel coding scheme for a communication system.
		Understanding different Error correcting methods.
		Understand and apply fundamental principles of data communication and networking.
		Apply flow and error control techniques in communication networks.
		Students will be able to perform the Management Functions

304188	Business Management	Get overview of Management Science aspects useful in business
		To Develop Project Management aspect and Entrepreneurship Skills.
		Students will be able to perform the functions in the Marketing Mix
		Get motivation for Entrepreneurship
		Students will be able to assess ethical issues in Business situations
304189	Advanced Processors	Describe the ARM microprocessor architectures and its feature.
		Interface the advanced peripherals to ARM based microcontroller
		Design embedded system with available resources.
		Use of DSP Processors and resources for signal processing applications.
304190	System Programming and Operating Systems	To understand fundamentals of system programming and operating systems.
		To study and understand how the system programming and operating system abstractions can be interpreated
		To develop comprehensive skills to Design Assemblers,Macro Processors,Compiler and interpreters
		To understand the importance of application of linkers, loaders and Software tools in system Programming
		To Implement System Programming concepts and Operating systems components
304194	Power and ITCT Lab	Design & implement a triggering / gate drive circuit for a power device.
		Understand, perform & analyze different power converters.
		Design & implement over voltage / over current protection circuit.
		Design a data compression scheme using suitable source coding technique.
		Design a channel coding scheme for a communication system.
		Understand and apply fundamental principles of data communication and networking.
		Implement information theoretic analysis using different information Measures.
		Implement different source coding techniques.
		Implement Encoding & decoding techniques for various codes.
		Understand how to transmit and receive text data with coding techniques.
		Understand and apply various Data compression techniques.
		Apply concepts to implement networking protocols.
304195	Advanced Processors and System Programming Lab	Programming ARM7 based microcontroller
		Learn & understand UART communication
		Learn the concept of interrupt
		Learn communication protocol
		Programming DSP based microcontroller
		Understand the need of DSP processor
		To understand system software concepts, like the use and implementation of assembler, macros, linker, loader and compiler.
		To understand the concept of lexical analyzer and implement it.
		To explore memory allocation methods, input output devices and file system w.r.t various operating system.
		To understand the Deadlock, Deadlock avoidance, Deadlock Detection algorithms
		To study and Implement various processes, scheduling techniques schemes in operating system
		Interpret various OS functions used in Linux/Ubuntu and study its system calls.
304196	Employability Skills and Mini Project	To understand the —Product Development Process" including budgeting through Mini Project.
		To plan for various activities of the project and distribute the work amongst team members.
		To inculcate electronic hardware implementation skills by - Learning PCB artwork design using an appropriate EDA tool.
		Imbibing good soldering and effective trouble-shooting practices.
		Following correct grounding and shielding practices.

		To develop student's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Mini Project.
		To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes (COs)

BE (Electronics and Telecommunication) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
404181	VLSI Design and Technology	Write effective HDL coding for digital design.
		Apply knowledge of real time issues in digital design.
		Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
		Design CMOS circuits for specified applications.
		Analyze various issues and constraints in design of an ASIC.
		Apply knowledge of testability in design and build self test circuit.
404182	Computer Networks and Security	Understand fundamental underlying principles of computer networking
		Describe and analyze the hardware, software, components of a network and their
		Analyze the requirements for a given organizational structure and select the most
		Have a basic knowledge of installing and configuring networking applications.
		Specify and identify deficiencies in existing protocols, and then go onto select new and
		Have a basic knowledge of the use of cryptography and network security.
404183	Radiation and Microwave Techniques	Explain various performance parameters of radiating elements
		Analyze various radiating elements and arrays
		Apply the knowledge of waveguide fundamentals in design of transmission lines
		Analyze and set up a system consisting of various passive microwave components
		Explain and analyze tube based and solid state active devices along with their applications
		Measure various performance parameters of microwave components
404184A	EL-I Digital Image and Video Processing	Understand the various concepts, terminologies and architecture(Physcial and Logical) of
		Use sensors and actuators for design of IoT. Study varrious Sensors and Actuators their
		Understand and apply various protocols for design of IoT systems namely
		Use various techniques of data storage and analytics in IoT. Bigdata and its uses,
		Understand various applications of IoT Example:Home Automation Sysytem like
		Agricultural Applications namely for Irrigating the fields,Smart City Apllicatiions like Waste or Garbage management,Street light Control etc.
404184B	EL-I Industrial Drives and Controls	Understand the basic principles of power electronics in drives and its control, types of drives and basic requirements placed by mechanical systems on electric drives for various applications
		Understand the operation of 1ϕ & 3ϕ converter drives for separately excited & series DC motors, dual converter drives, 2 quadrant and 4 quadrant DC chopper drives, Open-loop & closed-loop control of DC drives with transfer function, Dynamic and regenerative braking. Protection circuits for DC drives.
		Learn speed control of induction motor drives in an energy efficient manner using power electronics. To study and understand the operation of both classical and modern induction motor drives like FOC or Vector control.
		Learn and understand working of various types of synchronous motors and their drive systems
		Learn stepper motors & drives, BLDC and SRM motors and drives
		Understand modern control techniques of Fuzzy logic and ANN in motor drive applicatio
		Understand design of embedded system

404184C	EL-I Embedded System and RTOS	Use RTOS in embedded application
		Use modern architecture for embedded system
		Use Linux for embedded system development
		Use open platform for embedded system development
404184D	EL-I Internet of Things	Understand the various concepts, terminologies and architecture(Physcial and Logical)
		Use sensors and actuators for design of IoT. Study varrious Sensors and Actuators their
		Understand and apply various protocols for design of IoT systems namely
		Use various techniques of data storage and analytics in IoT. Bigdata and its uses,
		Understand various applications of IoT Example:Home Automation Sysytem like
		Agricultural Applications namely for Irrigating the fields,Smart City Apllicatiions like Waste or Garbage management,Street light Control etc.
404185A	EL-II Wavelets	On completion of the course, student will be able to
		Explore and learn the basics of linear algebra.
		Identify the need of Wavelet transform and its properties.
		Analyze the 1-D and 2-D signal using discrete wavelet transform.
		Analyze the signal using Multi resolution analysis
		Use wavelet transform in different applications like data compression, denoising, enhancement etc.
404185B	EL-II Electronics Product Design	Understand various stages of hardware, software .
		Importance of Product test & test specification.
		Special design consideration and importance of documentation.
		Understanding different Product debugging and testing methods.
		Understand various stages of PCB design.
		Describe an engineering design and development process.
404185C	EL-II Optimization Techniques	Describe clearly a problem, identify its parts and analyze the individual functions.
		Perform mathematical translation of the verbal formulation of an optimizationproblem.
		Design algorithms, the repetitive use of which will lead reliably to finding an approxim solution
		Discover study and solve optimization problems.
		Investigate study, develop, organize and promote innovative solutions for various applications.
404185D	EL-II Artificial Intelligence	Design and implement key components of intelligent agents and expert systems.
		To apply knowledge representation techniques and problem solving strategies to comm AI applications.
		Apply and integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.
		Build rule-based and other knowledge-intensive problem solvers.
		To apply an understanding of pattern recognition in application & apply them
		To be able to analyze natural language
404185E	EL-II Electronics in Agriculture	Understand Role of computers & virtual instrumentation.
		Provide communication solution for interpreting environmental parameters with Electronics systems.
		Describe Instrument technology used in agriculture.
		Apply knowledge of Electronics in Agriculture.
		Understand Greenhouse Technology & Role of Electronics Governance.
404186	Lab Practice I (CNS+RMT)	Understand fundamental underlying principles of computer networking
		Describe and analyze the hardware, software, components of a network and their interrelations.
		Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
		Have a basic knowledge of installing and configuring networking applications.

		To introduce fundamental theory of radiation and microwaves.
		To understand design principles of various radiating elements.
		To understand theory of passive and active components of microwave systems
		To learn microwave measurement techniques
404187	Lab Practice II (VLSI D&T + Elective I)	Write effective HDL coding for digital design.
		Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
		Design CMOS circuits for specified applications.
		Apply knowledge of testability in design and build self test circuit.
		Develop and implement basic mathematical operations on digital images.
		Analyze and solve image enhancement and image restoration problems.
		Identify and design image processing techniques for object segmentation and recognition.
		Represent objects and region of the image with appropriate method.
		Explore video signal representation and different algorithm for video processing
		Use sensors, actuators and wireless technologies for design of IoT.
		Understand and apply various protocols for design of IoT systems.
		Use various techniques of data storage and analytics in IoT.
404189	Mobile Communication	Apply the concepts of switching technique and traffic engineering to design multistage Networks
		Explore the architecture of GSM.
		Differentiate thoroughly the generations of mobile technologies.
404190	Broadband Communication Systems	Carry out Link power budget
		Rise Time Budget by proper selection of components
		Check components viability.
		Carry out Satellite Link design for Up Link and Down Link.
404191A	Machine Learning	To compare and contrast pros and cons of various machine learning techniques and to get an in sight of when to apply a particular machine learning approach.
		To mathematically analyze various machine learning approaches and paradigms.
		To implement convolution neural networks in recognition applications
404191B	PLCs and Automation	Understand PLC architecture
		Develop PLC ladder programs for simple industrial applications
		Design Automation systems for industrial applications
		Implement the Engineering Automation using PLC approach
404191C	Audio and Speech Processing	Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human hearing.
		Analyze speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch).
		Analyze speech signal for extracting LPC and MFCC Parameters of speech signal.
		Apply the knowledge of speech and audio signal analysis to build speech processing applications like speech coding, speech recognition, speech enhancement and speaker recognition /verification.
404191D	Software Defined Radio	Compare SDR with traditional Hardware Radio HDR.
		Implement modern wireless system based on OFDM, MIMO & Smart Antenna.
		Build experiment with real wireless waveform and applications, accessing both PHY and MAC, Compare SDR versus MATLAB and Hardware Radio
		Work on open projects and explore their capability to build their own communication System.
404191E	Audio Video Engineering	To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver, Picture Tubes and Television Camera Tubes.
		To study the various Colour Television systems with a greater emphasis on television
		To study the advanced topics in Digital Television and High Definition Television.

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Department of Computer Engineering

Course Outcomes (COs)

SE (Computer Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
210241	Discrete Mathematics	Solve real world problems logically using appropriate set, function, and
		Interpret the associated operations and terminologies in context
		Analyze and synthesize the real world problems using discrete mathematics
		Design mathematical model, as well as to analyze and interpret data
		Analyze and synthesize the real world problems using tree
		Solve the real world problem logically using Algebraic Structures
210242	Digital Electronics & Logic Design	Realize and simplify Boolean Algebraic assignments for designing digital CKTS using K-maps
		Apply the knowledge to appropriate IC as per the design specifications
		Design and implement Combinational digital circuits as
		Design and implement Sequential digital circuits as
		Design simple digital systems using VHDL
		Develop simple embedded system for simple real world application
210243	Data Structures & Algorithms	Develop knowledge of basic data structures for storage and retrieval of data
		Use linear and nonlinear data structures like stack, queues and linked list
		Understand and design the algorithms to solve programming problems
		Analyze and compare algorithms for efficiency using Big-O notation
		Analyze the problems to apply suitable algorithm and data structure
		To develop application using data structures.
210244	Computer Organization & Architecture	Demonstrate computer architecture concepts & analyze the principles of computer architecture using examples drawn from
		Design of modern memories related with demonstration of Computer architecture Subjects
		Determine & Design for various techniques of computer I/O related with computer architecture.
		Design elements of modern instruction set & different addressing Modes
		Evaluate various design alternatives in processor organization.
		Analyze the principles of execution of instructions in hardwired & micro
210245	Object Oriented Programming	Analyze the strengths of object oriented programming
		Design and apply OOP principles for effective programming
		Develop programming application using object oriented programming
		Percept the utility and applicability of OOP
		Learn and apply features of OOP to model real life problems.
		Able to develop application using OOP which solve society problems

210246	Digital Electronics lab	Analyze Sequential circuits like Flip-Flops (Truth Table, Excitation table) & design the applications like Asynchronous and Synchronous Counters
		Design Sequential Logic circuits: Sequence generators, MOD counters with registers/Counters using synchronous /asynchronous counters
210247	Data Structures Lab	To explain Linear Data Structures.
		To apply stack to the given application.
		To apply queue to the given application.
		To compute various sorting algorithms.
210248	Object oriented Programming Lab	Implement the concept of exception and file handling
		Implement the various data structure using C++ programming
		Design and implement the application software using C++.
		Able to know basic architecture, memory system of 64 bit Linux operating system
		Implement and analysis the concept of function and polymorphism by using C++ programming-I
210249	Soft Skills	Effectively communicate through verbal/oral communication and improve the listening skills
		Write precise briefs or reports and technical documents.
		Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
		Become more effective individual through goal/target setting, self motivation and practicing creative thinking.
		Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, interpersonal relationships, conflict management and leadership quality.
SEM-II		
207003	Engineering Mathematics-3	Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits
		Solve problems related to Fourier transform, Z-Transform and applications to Signal and Image processing
		Apply statistical methods like correlation, regression analysis and probability theory for analysis and prediction of a given data as applied to machine intelligence
		Perform vector differentiation and integration to analyze the vector fields and apply to compute line, surface and volume integrals
		Analyze conformal mappings, transformations and perform contour integration of complex functions required in Image processing
		Analyse ,transformation for digital filter & Computer Graphics
210251	Computer Graphics	Analyze the strengths and weaknesses of programming languages for effective and efficient program development
		To inculcate the principles underlying the programming languages enabling to learn new programming languages
		To grasp different programming paradigms
		To use the programming paradigms effectively in application development
		To learn the various algorithms for generating and rendering graphical
		Student should be able to do Animation Programming
		Apply appropriate advanced data structure and efficient algorithms to approach the problems of various domain
		Design the algorithms to solve the programming problems

210252	Advanced Data Structures	Effective and efficient use of data structures in solving various Computer Engineering domain problems
		Analyze the algorithmic solutions for resource requirements and
		Use appropriate modern tools to understand and analyze the functionalities Confined to structure
		To design and implementation of various basic and advanced data structures
210253	Microprocessor	Understand the Basic programming model of 80386& apply assembly language programming to develop small real life embedded application.
		Demonstrate system architecture, memory management concepts.
		Analyze the mechanism of protection related to 80386 & understands the principles of multitasking.
		Apply assembly language programming with I/O & evaluate to design interrupts in 80386 modes.
		To understand architecture of the advanced processor thoroughly to use the resources for programming & understand the concepts of processor modes.
		To understand the higher processor architectures descended from 80386 architecture.
210254	Principles of Programming Languages	To analyze the strengths and weaknesses of programming languages for effective and efficient program development
		To inculcate the principles underlying the programming languages enabling to learn new programming languages
		To grasp different programming paradigms
		To use the programming paradigms effectively in application development
		To use Object Oriented Programming concept in application development
		CO6-To use Applet for Application development
210255	Computer Graphics lab	Understand the basic concepts of computer graphics.
		Design scan conversion problems using C++ programming.
		Apply clipping and filling techniques for modifying an object.
		Understand the concepts of different type of geometric transformation of objects in 2D and 3D.
		Understand the practical implementation of modeling, rendering, viewing of objects in 2D &3D.
		Understanding different fractal structures and implementation of Koch & Hilbert curves and animation sequences.
210256	Advanced Data Structures Lab	To apply appropriate advanced data structure and efficient algorithms to approach the problems of various domain.
		To design the algorithms to solve the programming problems.
		To use effective and efficient data structures in solving various Computer Engineering domain problems.
		To analyze the algorithmic solutions for resource requirements and optimization
		To use appropriate modern tools to understand and analyze the functionalities confined to the data structure usage.
210257	Microprocessor Lab	To perform various numerical computations using assembly language programming.
		To explain various types of 80386 modes and switching among them.
		To Describe the recursion technique in assembly language programming

		To Understand implementation of various DOS Commands.
		To Understand Numeric data processor and its working with main processor.

Course Outcomes (COs)

TE (Computer Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
310241	Theory of Computation	Introduce students to the mathematical foundations of computation including
		Enhance/develop student's ability to understand and conduct,mathematical
		Be exposed to a broad overview of the theoretical foundations of computer
		To Study abstract computing models
		To learn Grammar and Turing Machine
		To learn about the theory of computability and complexity
310242	Database Managements System	Design E-R Model for given requirements and convert the same into data
		Use database techniques such as SQL & PL/SQL
		Use modern database techniques such as NOSQL
		Explain transaction Management in relational database System
		Describe different database architecture and analyses the use of appropriate
		appropriate architecture in real time environment
		Students will be able to use advanced database Programming concepts Big dta
310243	Software Engineering & Project Management	Decide on a process model for a developing a software project
		Classify software applications and Identify unique features of various domains
		Design test cases of a software system
		Understand basics of IT Project management
		Plan, schedule and execute a project considering the risk management
		Apply quality attributes in software development life cycle
310244	Information Systems & Engineering Economics	Understand the need, usage and importance of an Information System to an
		Understand the activities that are undertaken while managing, designing,
		Further the student would be aware of various Information System solutions
		Outline the past history, present position and expected performance of a
		Perform and evaluate present worth, future worth and annual worth analyses
		Be able to carry out and evaluate benefit/cost, life cycle and breakeven
310245	Computer Networks	Analyze the requirements for a given organizational structure to select the
		Demonstrate design issues, flow control and error control
		Analyze data flow between TCP/IP model using Application, Transport and
		Illustrate applications of Computer Network capabilities, selection and usage
		Illustrate Client-Server architectures and prototypes by the means of correct
		Demonstrate different routing and switching algorithms
310246	Skill Development Lab	Create data-driven web applications
		Incorporate best practices for building applications.
		Employ Integrated Development Environment(IDE) for implementing and testing of software solution
		Construct software solutions by evaluating alternate architectural patterns.
		Understand and to use data advanced analytic tools
		Understand working of MySQL relational database and handle SQL objects such as Table, View, Index, Sequence, Synonym
		Populate and query relational databases using SQL DML statements for various database applications

310247	DBMS Lab	Use PL/SQL Programming concepts such as Cursors, Control structure and Exception handling Stored Procedures and Triggers for various database applications
		Understand working of MongoDB - NoSQL database and design basic MongoDB queries, Aggregation, Indexing & Map Reduce operations
		Design and develop Database navigation operations using various databases with front end technologies
310248	CN Lab	Analyze the requirements for a given organizational structure to select the most appropriate networking architectures, topologies, transmission medium and technologies.
		Demonstrate design issues, flow control and error control.
		Analyze data flow between TCP/IP model using Application, Transport and Network layer protocols.
		Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.
		Illustrate client-server architectures and protocols by the means of correct standards and technology.
		Demonstrate different routing and switching algorithms.
SEM-II		
310250	Design & Analysis of Algorithm	Argue the correctness of algorithms using inductive proofs and invariants.
		Find optimal solution by applying various methods.
		Design the algorithms to solve programming problems.
		Ability to analyze asymptotic runtime complexity of algorithms including
		Write mathematical modeling of algorithm for problem solving
		Make use of complexity theory in problem solving
310251	Systems Programming & Operating Systems	Analyze and synthesize system software
		Understand the internal of language translator
		Use tools like LEX & YACC
		Understand the Operating System internals
		Implement Operating System functions
		Understand process scheduling for multi-cores Operating System
310252	Embedded Systems & IoT	To understand fundamentals of IoT and embedded system including essence,
		To introduce students a set of advanced topics in embedded IoT and lead
		To develop comprehensive approach towards building small low cost
		To understand fundamentals of security in IoT
		To learn to implement secure infrastructure for IoT
		To learn real world application scenarios of IoT along with its societal and
310253	Software Modeling & Design	Analyze the problem statement (SRS) and choose proper design technique for
		Design and analyze an application using UML modelling as fundamental tool
		Apply design patterns to understand reusability in OO design
		Decide and apply appropriate modern tool for designing and modelling
		Apply proper architecture design technique for designing application
		Decide and apply appropriate modern testing tool for testing web-
310254	Web Technologies	Analyze given assignment to select sustainable web development design
		Develop web based application using suitable client side and server side web
		Analyze given assignment to select sustainable web development design
		To decide the choice of web technology for designing the web
		To develop the interaction application
		To develop reach the web based Application
310255	Seminar & Technical	On completion of the course, student will–
		Be able to be familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.

		Be able to improve skills to read, understand, and interpret material on technology.
		improve communication and writing skills
310256	WT Lab	Installation, configuration of Web Servers and Developing Web Page using HTML, CSS and XML.
		To Study validation of web page Contents
		To study Dynamic Web Page Creation using Servlet and JSP
		To study Dynamic Web Page Creation using PHP, Mysql and AJAX
		Develop solution to complex problems using appropriate method, technologies, frameworks
		Develop web based application using suitable client side and server side web technologies web services and content management
310257	SP&OS Lab	Design and evaluate assembler Pass-I & Pass-II
		Design and evaluate macro Pass-I & Pass-II
		Create lexical analyzer using lex tool
		Create syntax analyzer using YAAC tool
		Create and use dynamic link libraries
		Understand and implement process scheduling mechanisms
		Understand and implement memory management functionalities in operating system
310258	ES & IoT Lab	To understand functionalities of various single board embedded platforms fundamentals
		To develop comprehensive approach towards building small low cost embedded IoT system
		To understand different sensory inputs
		To develop remote controlled smart system
		To understand the process to store sensor data on cloud
		To develop smart surveillance system

Course Outcomes (COs)

BE (Computer Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
410241	High Performance Computing	Describe different parallel architectures, interconnect networks, programming models
		Develop an efficient parallel algorithm to solve given problem
		Analyze and measure performance of modern parallel computing systems
		Build the logic to parallelize the programming task
		An ability to apply design and development principles of parallelization in the construction of software systems of varying complexity.
		Understand the CUDA programming models and Parallelize sequential tasks.
410242	Artificial Intelligence and Robotics	On completion of the course, student will be able to–
		Identify and apply suitable Intelligent agents for various AI applications
		Design smart system using different informed search / uninformed search or heuristic approaches.
		Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem.
		Apply the suitable algorithms to solve AI problems.
		On completion of the course, student will be able to–
		Write case studies in Business Analytic and Intelligence using mathematical models

		Present a survey on applications for Business Analytic and Intelligence
410243	Data Analytics	Provide problem solutions for multi-core or distributed, concurrent/Parallel environments
410244(D)	Ele-1:Data Mining and Warehousing	On completion of the course the student should be able to-
		Apply basic, intermediate and advanced techniques to mine the data
		Analyze the output generated by the process of data mining
		Explore the hidden patterns in the data
		Optimize the mining process by choosing best data mining technique
410245(B)	Ele-2:Software Testing and Quality Assurance	On completion of the course, student will be able to–
		Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
		Design and develop project test plan, design test cases, test data, and conduct test operations
		Apply recent automation tool for various software testing for testing software
		Apply different approaches of quality management, assurance, and quality standard to software system
		Apply and analyze effectiveness Software Quality Tools
410245(A)	Distributed Systems	On completion of the course, student will be able to–
		Able to learn and apply the concept of remote method invocation and Remote Procedure Calls
		Able to analyze the mechanism of peer to peer systems and Distributed File Systems
		Demonstrate an understanding of the challenges faced by current and future distributed systems
410246	Laboratory Practice I	Build the logic to parallelize the programming task
		Analyze and measure performance of modern parallel computing systems
		Identify and apply suitable Intelligent agents for various AI applications
		"Design smart system using different informed search / uninformed search or heuristic approaches"
		Understand the statistics and Mathematics use to solve big data analytics problem
		Understand the impact of big data for business decisions and strategy
410247	Laboratory Practice II	Able to learn and apply the concept of remote method invocation and Remote Procedure Calls
		Learn and apply the concept of Inter-process Communication.
		Analyze the different distributed algorithm.
		Analyze the mechanism of peer to peer systems and Distributed File Systems.
		Learn and apply the concept of Time, Global state and coordination.

		Demonstrate an understanding of the challenges faced by current and future distributed systems.
		Implement the mini projects based on software testing framework.
410248	Project Stage I	Solve real life problems by applying knowledge.
		Analyze alternative approaches, apply and use most appropriate one for feasible solution.
		Write precise reports and technical documents in a nutshell.
		Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work,
		Inter-personal relationships, conflict management and leadership quality.
SEM-II		
410250	Machine Learning	On completion of the course, student will be able to–
		Distinguish different learning based applications
		Apply different preprocessing methods to prepare training data set for machine learning
		Design and implement supervised and unsupervised machine learning algorithm.
		Implement different learning models
		Learn Meta classifiers and deep learning concepts
410251	Information and Cyber Security	On completion of the course, student will be able to–
		Gauge the security protections and limitations provided by today's technology.
		Identify information security and cyber security threats.
		Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
		Build appropriate security solutions against cyber-attacks.
410252(B)	Elective III Compilers	Design and implement a lexical analyzer and a syntax analyzer
		Specify appropriate translations to generate intermediate code for the given
		Compare and contrast different storage management schemes
		Identify sources for code optimization
410252(D)	Elective III Soft Computing and Optimization Algorithms	Apply soft computing methodologies, including artificial neural networks, fuzzy sets, fuzzy logic, fuzzy inference systems and genetic algorithms
		Design and development of certain scientific and commercial application using computational neural network models, fuzzy models, fuzzy clustering applications and genetic algorithms in specified applications.
410253(C)	Elective IV Cloud Computing	To install cloud computing environments.
		To develop any one type of cloud
		To explore future trends of cloud computing
410254	Laboratory Practice III	Practical hands on is the absolute necessity as far as employability of the learner is concerned
		The presented course is solely intended to enhance the competency by undertaking the laboratory assignments of the core courses
410254	Laboratory Practice IV	Practical hands on is the absolute necessity as far as employability of the
		The presented course is solely intended to enhance the competency by undertaking the laboratory assignments of the elective courses.
410256	Project Work Stage II	Show evidence of independent investigation
		Critically analyze the results and their interpretation
		Report and present the original results in an orderly way and placing the open questions in the right perspective
		Link techniques and results from literature as well as actual research and future research lines with the research.
		Appreciate practical implications and constraints of the specialist subject

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Department of Civil Engineering

Course Outcomes (COs)

SE (Civil Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
201001	Building Technology & Materials	Identify types of building and basic requirement of building components.
		Explain typesof masonry , formwork, casting procedure and necessity ofunderpinning
		Elucidate different types of floooring and roofing material.
		Describe types of doors,windows,arches and lintels.
		Illuminate means of vertical circulation and protective coating.
		Explain different materials especially eco-friendly materials and safety measures to be adopted at any construction.
201002	Strength of Materials	Compute different type of stresses in determinate, indeterminate, homogeneous and
		Develop bending and shear stress diagram.
		Determine the torsional stresses and stresses due to strain energy for different loading
		Explain the concept of principal stresses due to combined loading and able to compare
		Plot loading diagram, Shear Force Diagram (SFD) and Bending Moment Diagram
		Analyze axially and eccentrically loaded colum
201003	Geotechnical Engineering	Differentiate the different types of soil and their engineering properties and classify
		Determine the soil properties in laboratory and develop a proficiency in handling
		Determine the soil properties in laboratory and develop a proficiency in handling
		Develop an understanding of the influence of water flow on the engineering behaviour
		Analyze engineering properties like compaction, permeability, soil shear strength.
		Compute the lateral thrust due to backfill on the retaining walls.
207001	Engineering Mathematics-III	Solve higher order linear differential equations and apply to civil engineering
		Solve system of linear equations using direct and iterative numerical techniques and develop solutions to ordinary differential equations using single step and multistep methods applied to structural systems.
		Apply statistical methods like correlation, regression analysis in analyzing and
		Perform vector differentiation and integration, analyze the vector fields and apply to
		Solve various partial differential equations such as wave equation, one and two
201004	Fluid Mechanics-I	Ability to use fluid properties, dimensional analysis for solving problems of fluid
		Ability to solve fluid statics problems.
		Ability to measure fluid pressure.
		Ability to calibrate discharge measuring instrument like venturimeter, orifice meter.
		Ability to Distinguish between various types of fluid flows and find the fluid velocity
		Ability to Design pipes to carry particular amount of discharge.
201005	Architectural Planning and Design of Buildings	Ability to make use of principles of planning and principles of architectural Planning.
		Ability to analyze the available primary or secondary data and plan different types of
		Ability to improve the status of existing structures by proposing appropriate green
		Ability to plan effectively various types of buildings according to their utility with

		Ability to understand and resolve contemporary issues at multi-dimensional functional
		Improve the status of existing structures by proposing appropriate green measures.
201006	Surveying	Students come up with the basics , importance & key role of the surveying in civil
		Make them able to know the different aspects of surveying & its application in civil
		Make them able to apply principles & application of different types of surveying such
		Students capable to apply knowledge of advance instruments like Total Station, digital
		Make them capable to undestand & solve field problems
		Makes the students capable so that they always shuld have alternative option for the
201007	Concrete Technology	Understand chemistry, properties, and classification of cement, fly ash, aggregates
		Prepare and test the fresh concret
		Get acquainted to concrete handling equipments and different special concrete types.
		Get acquainted to concrete handling equipments and different special concrete types.
		Design concrete mix of desired grade
		Predict deteriorations in concrete and repair it with appropriate methods and
201008	Structural Analysis -I	Understand the basic concept of static and kinematic indeterminacy, slope and deflection of determinate and indeterminate beams for analysis of structures
		Analyze indeterminate beams structures and frames
		Evaluate determinate and indeterminate trusses and its application in the field.
		Apply influence line diagrams for the analysis of structures under moving load.
		Analyze two and three hinged arches and its application.
		Apply plastic analysis for indeterminate steel structures by limits state method.
207009	Engineering Geology	Explain the basic concepts of engineering geology.
		Differentiate between the different rock types, their inherent characteristics and their
		Understand physical properties, mechanical properties of the minerals and their
		Identify favourable and unfavourable conditions for the buildings, roads, dam,
		Explain mass wasting processes, effects of mass wasting process on the civil
		Interpret geohydrological characters of the rocks present at the foundations of the
		Understand Seismic activities and its effect on the civil engineering construction and
201010	Soft Skill	To help the students in building interpersonal skills.
		To develop skill to communicate clearly.
		To enhance team building and time management skills
		To learn active listening and responding skills..
		To develop interpersonal relationship

Course Outcomes (COs)

TE (Civil Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
301001	Hydrology & Water Resources Engineering	Measure as well as analyze precipitation, evaporation, discharge etc. with the use of different methods and/or equipments.
		Explain the methods of irrigation and assess the canal revenue.
		Describe the ground water hydrology and study of different types of well.
		Analyze the flood frequency and runoff hydrograph.
		Characterize the various terms related to reservoir planning.
		Explain the participatory irrigation management and process of water logging.

301002	Infrastructure Engineering & Construction Techniques	To understand the meaning and importance of Infrastructure Engineering
		To study railway systems and its construction techniques
		To study tunnels and docks and harbours along with their importance
		To study different construction equipments
		To study different construction Techniques
		To study geometric design of Railway track
301003	Structural Design-I	Students come up with the basic of design philosophy and is application for design of
		Students are capable to use steel table, different IS codes etc.
		Students are able to design different steel structural elements on its own.
		Students are well prepared to execute the design stuructural componant throu project
		Students are get aware the imortance of steel structures through site visits.
		Makes the students capable so that they always shuld have alternative option for the
301004	Structural Analysis-II	Ability to idealized & analyze statically determinate and indeterminate structures by
		Ability to analysis of indeterminate beams and frames without and with sway by using
		Evaluate statically indeterminate structures using flexibility method
		Analyze statically indeterminate structures using stiffness method
		Analyze 2D frame structures for horizontal and vertical loads by approximate methods
		An ability to identify and solve engineering problem using finite element method
301005	Fluid Mechanics-II	Understand and describe the basic fundamentals of fluid flow around submerged
		Apply the knowledge of basics for designing the objects submerged in fluid flow, open
		Conduct the experiments in the laboratory to verify the designs and derive the
		Evaluate and inspect the execution, performance and functioning of the open channel
301006	Employability Skills Development	Ability to understand need of technical competence required for problem solving.
		Ability to understand professional and group behavioural ethics.
		Ability to understand employers requirements.
		Ability to Understand the importance of teamwork and group discussions skills.
		Ability to Develop time management
301007	Advance Surveying	Understand geodetic and triangulation surveying and apply SBPS in solving
		Know objects, applications of Hydrographic Surveying.
		Plan and execute triangulation survey, Know the triangulation adjustments, Identify
		Make measurements on RS images and aerial photographs using photogrammetric
		Know trigonometric leveling and setting out construction works.
301008	Project Management and Engineering Economics	Able to explain the importance, objective, and functions of project management.
		Able to analyze the network for planning and scheduling of project
		Able to apply project monitoring, resource allocation as well as basic knowledge of
		Able to apply a basic project economics in construction industry.
		Able to apply different methods of analysis for project resource management and
		Able to evaluate conditions for project appraisal and preparation of project feasibility
301009	Foundation Engineering	Understand soil exploration methods.
		Analyze shallow foundations and bearing capacity.
		Compute and analyze the consolidation settlements.
		Analyze deep foundations.
		Analyze cofferdams, foundations andn expansive soils.
		Study of Earthquake and soil reinforcements.
301010	Structural Design-II	Students come up with the basics of design philosophy and is application for design of
		Students are capable to use different IS codes such as IS 456-2000, IS 13920 & SP 34.
		Students are able to design different RCC structural elements on its own.
		Students are well prepared to execute the design RCC members through project works.
		Students are get aware about design & construction of RCC structures/members
		Makes the students capable so that they always shuld have alternative option for the site situation.

301011	Environmental Engineering-I	Ability to describe Water Supply Scheme and Population Forecasting.
		Ability to understand Physical Treatments of potable water.
		Ability to understand Chemical treatments on water to purify.
		Ability to explain improvement of water quality by advanced treatment.
		Ability to get knowledge of design of water treatment plant, water distribution and
301012	Seminar	Analysis and comprehension of proof-of-concept and related data.
		Establish motivation for any topic of interest and develop a thought process for
		Organize a detailed literature survey and build a document with respect to technical
		Make use of new and recent technology for creating technical reports
		Effective presentation and improve soft skills.

Course Outcomes (COs)

BE (Civil Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
401001	Environmental Engineering II	To know and comprehend concepts of waste water qulity and standards, propogation & wastewater collection system
		To determine the methods for design of sewerage system components
		To know about characteristics of solid waste and problems associated with solid waste disposal.
		To know about various methods of solid waste treatment
		To understand the sources and characteristics, Effects of Discharges of Industrial Waste on receiving bodies of water.
		To understand the methods of treatment of Industrial Wastewater.
401002	Transportation Engineering	Classify the roads, design the alignments and study of 20 year road development plans.
		Design the road geometry such as cross section elements, SSD, OSD, Horizontal, Vertical curves and intersections.
		Understand various traffic characteristics & analysis and use the data for road design.
		Explain the properties of soil, aggregates and bitumen for road construction and design of Flexible and Rigid pavement.
		Explain the construction of roads, suggest the remedial measures for the road failure and design the drainages.
		Explain the modern trends in Highway materials, constructions techniques & maintenance of roads.
401003	Structural Design and Drawing-III	Understand prestressing method and Evaluate stress - loss calculation
		Analyse and Design prestressing girder and prestressing slab.
		Design of flat slab by using direct design method.
		Design of different type of retaining wall for different surcharge condition.
		Understand and design of resting on ground water tank by using working stress method.
		Explain type of vibration and Identify various methods of earthquake analysis and design for frame type structure under lateral and vertical loading condition
401004	Architecture & Town Planning (ELE-I)	Awareness of the role of an urban planner and architect in planning, designing and landscaping.
		Able to identify significance of built environment, urban design, renewal for quality of life and livability.
		Able to explain the importance of Sustainable development.

		Able to define stages of town planning and development through study of planning of new towns.
		Able to explain the importance of surveys and hierarchy of planning.
		Aware of the acts related to the planning of a region and a town.
401005	TQM & MIS in Civil Engineering (ELE-II)	To study the importance of quality in construction.
		To study MIS and its application in construction.
		To identify defects and its prevention and TQM philosophy of Six Sigma.
		Importance of Total Quality Management and ISO in construction.
		To study applications of TQM and different philosophies like Kaizen, Benching and Supply chain management.
		To study ERP system and its importance.
401006A	Project Phase - I	Identify, formulate and solve problems related to civil engineering.
		Work in a group as a part of multidisciplinary team with professional responsibility
		Analysis and design of structure to meet desired needs within realistic constraints
		Review literature and finalize problem statement.
		Plan activity schedule and implementation in a given time span.
		Prepare and present technical report.
		Apply modern design and analysis tools.
401007	Dam and Hydraulics Structure	Understand the various types of dams and select a particular type considering technical, economic, environmental, climatic, topographic and social factors
		Understand the importance of dam safety and instrumentation required to assess the health of dam.
		Understand the construction & maintenance of gravity dam, earth dam, arch dam, buttress dam and Carry out stability analysis of gravity dam, earth dam & weir.
		Acquire knowledge about components, classification, significance and selection of spillway, energy dissipating devices, spillway gates, diversion head works, canal, canal structures, cross drainage works and River training structures
		Design of Ogee spillway, weir on permeable foundation, lined canal, cross drainage works.
		Acquire knowledge about components, classification and layout of hydropower plants.
401008	Quantity Surveying Contracts & Tenders.	Able to find out Estimates for given construction work.
		Able to analyse the rate of materials of labours while estimating as per the given specification.
		Able to Understand and apply the procedure of Tendering, Contract and Arbitration including work of statutory bodies like PWD etc.
401009	Hydro Power Engineering (ELE-III)	Understand and discuss energy resources and energy systems available for production of electric power in India and world.
		Explain the types of hydro power plants.
		Explain the load assessment and estimation of hydro power potential.
		Explain the planning of layout of hydro power plant.
		Design of the penstocks and surge shaft.
		Discuss the economic conditions, legal conditions and consequences of hydro power.
401010	Construction Management (ELE-IV)	Understand the roles and responsibilities of a project manager
		Prepare schedule of activities in a construction project.
		Prepare tender and contract document for a construction project.
		Understand safety practices in construction industry.
		Identify the equipment used in construction.

401006B	Project Phase -II	Identify, formulate and solve problems related to civil engineering.
		Work in a group as a part of multidisciplinary team with professional responsibility
		Analysis and design of structure to meet desired needs within realistic constraints
		Review literature and finalize problem statement.
		Plan activity schedule and implementation in a given time span.
		Prepare and present technical report.
		Apply modern design and analysis tools.

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Department of Applied Science and Engineering

Course Outcomes (COs)

FE - 2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
107009	Engineering Chemistry	Develop innovative methods to produces oft water for industrial use and potable water at cheaper cost.
		Substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
		Design economically and new methods of synthesis nano material.
		Apply their knowledge for protection of different metals from corrosion.
		Have the knowledge of converting solar energy into most needy electrical energy efficiently and economically to reduce the environmental pollution.
104012	Basic Electronics Engineering	Understand the some basic electronics components and circuits.
		Understand basics operations of diodes and transistors circits & also applications of these components.
		Understands working of some IC based circuits.
		Understands logic gates and their application in digital circuits
		Understands working of some power electronics devices ,transdusers and applications of transducers.
		Able to know the basic aspect of electronic communication system
110003	Fundamentals of Programming Languages-I	Use modular programming approach in diversified problem domains
		Apply programming logic to solve real world problems
		Decide effectiveness of computer based solutions
110010	Fundamentals of Programming Languages-II	To learn and acquire art of computer programming.
		To know about some popular programming languages and how to choose a programming language for solving a problem using a computer.
		To learn the foundation programming in embedded C, Advanced Programming
107002	Engineering Physics	Understanding of interference techniques in thin films and diffraction of light and try to apply
		Understand the fundamentals of acoustics (Sound Waves) and apply it to realistic problems in architectural acoustics. Basics of ultrasonic and its applications in various fields.
		Understanding some concept related to Polarization with various methods, concept of laser and imparts their engineering applications in various fields.
		Understanding about basic concept of Solid State Physics. On this basis, study of functioning of few semiconductor devices and provide hands-on experience.
		Understanding significance of Wave Particle Duality and realize the behavior of microscopic systems. Developing Schrodinger's equations and its application to one dimensional quantum mechanical problem.

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		Understand basics of superconductors and study their technological applications in various fields. Study of few methods of synthesis of nanoparticles, their physical properties and appreciate their applications in diverse fields.
101005	Basic Civil & Environmental Engineering	To give knowledge of some basic civil engineering areas.
		To introduce Basic materials for construction and type of structures.
		To understand the basic concept of surveying and modern survey methods.
		To understand the concept of Environment and Solid waste management.
		Concept of an integrated built environment natural and manmade, eco-friendly materials and role of by-laws in regulating the environment.
		To understand the type of energy and sources, causes, effects, remedial measures of pollution.
101011	Engineering Mechanics	Apply fundamental knowledge of mathematics, science, and engineering.
		Design and conduct mechanics experiments.
		Analyze and interpret experimental and computational mechanics data.
		Design a system, component or process to meet desired needs by synergistically combining mechanics of materials, fluid mechanics, and dynamics, when necessary.
		Identify, formulate, and solve engineering problems involving mechanics of rigid bodies.
		Effectively function as a member of multi-disciplinary technical team and engage in life-long learning
107001	Engineering Mathematics-I	To introduce to students De-Moivre's theorem and its application, hyperbolic functions.
		To introduce to students rank of matrix, solution of simultaneous equations, Eigen values and Eigen vectors.
		To introduce to students partial differentiation and its applications
		To introduce students higher order derivatives of various standard functions and Leibnitz's Theorem.
		To introduce to students the expansion of functions about any point and to evaluate the indeterminate forms of limits
107008	Engineering Mathematics-II	Modeling of various physical systems such as Newton's Law of cooling, L-C-R circuits, rectilinear motion, mass-spring system, heat transfer etc.
		Design and analysis of continuous and discrete system, where knowledge of Fourier series and Harmonic analysis is required.
		Advanced techniques to evaluate integrals.
		Measurement of arc lengths of various curves.
		Sphere, cone and cylinder that arise in vector calculus, electro-magnetic field theory, cad-cam, computer graphics etc.
		Multiple integrals which are used in calculating areas, volumes, mean and RMS values, mass, moment of inertia and centre of gravity.
102006	Engineering Graphics – I	To draw Basic Engineering drawings formats and take field dimensions.
		To be able to take data and transform it into graphic drawings.
		To be able to draw different views of Solids.
		To be able to draw Engineering Curves.
		To be able to draw Orthographic Projections.
		Isometric views of objects are used to imagine the shape and size of objects.
		To comprehend the safety measures required to be taken while using the tools.
		To identify different operations and tools used in machine tools.

111007	Workshop Practices	To select proper tools required for specific operation and understand applications of these tools.
		To acquire practical skills in trade.
		To know difference between Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes.
		Students will learn Foundry practices like pattern making and mold making.
102013	Basic Mechanical Engineering	This course will help students to acquire knowledge of mechanical engineering.
		Describe the scope of mechanical engineering with multidisciplinary industries.
		Understand and identify common machine elements and Power transmission devices.
		Understand the concept of design in mechanical engineering and machine tools used.
		Impart Knowledge of thermodynamics and its industrial use.
		Understand laying principles of energy conversion system and power plants
102014	Engineering Graphics II	Physical realization of drawing and its different parameters required for its presentation.
		The drawings of objects which are studied here are used to communicate for different engineering purpose.
		Isometric views of the objects are used to imagine the shape and size of objects. Some engineering curves are studied which require to develop actual views of objects.
		Learn to sketch and take field dimensions.
		Learn to take data and transform it into graphic drawings.
		Learn basic engineering drawing formats.
103004	Basic Electrical Engineering	Understand and demonstrate the fundamental of electromagnetism, single phase transformer, electrostatics, and A.C and D.C. circuits.
		Apply concept of electromagnetism for working of transformer.
		Differentiate between electrical and magnetic circuits.
		Compare between A.C and D.C circuits.
		Draw the phasor diagrams for single phase and three phase Circuits.
		Provide solutions for network by applying various laws and theorems.
		Demonstrate the awareness on social issues like conversion of electrical energy electrical safety etc.
		Develop abilities to excel in competitive exams required for post graduation and research.

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SHRI CHHATRAPATI SHIVAJI RAJE COLLEGE OF ENGINEERING
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Department of Mechanical Engineering

Course Outcomes (COs) SEM-I

SE (Mechanical Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
207002	Engineering Mathematics – III	Solve higher order linear differential equations and apply to modeling and analyzing mass spring systems.
		Apply Laplace transform and Fourier transform techniques to solve differential equations involved in Vibration theory, Heat transfer and related engineering applications.
		Apply statistical methods like correlation, regression analysis in analyzing, interpreting experimental data and probability theory in testing and quality control.
		Perform vector differentiation and integration, analyze the vector fields and apply to fluid flow problems
		Solve various partial differential equations such as wave equation, one and two dimensional heat flow equations.
202041	Manufacturing Process-I	Understand and analyze foundry practices like pattern making, mold making, Coremaking and Inspection of defects.
		Understand and analyze Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes.
		Understand different plastic molding processes, Extrusion of Plastic andThermoforming
		Understand different Welding and joining processes and its defects.
		Understand, Design and Analyze different sheet metal working processes
		Understand the constructional details and Working of Centre Lathe
202042	Computer Aided Machine Drawing	Understand the importance of CAD in the light of allied technologies such as CAM, CAE, FEA, CFD, and PLM.
		Understand the significance of parametric technology and its application in 2D sketching.
		Understand the significance of parametric feature-based modeling and its application in 3D machine components modeling.
		Ability to create 3D assemblies that represent static or dynamic Mechanical Systems.
		Ability to ensure manufacturability and proper assembly of components and assemblies.
		Ability to communicate between Design and Manufacturing using 2D drawings.
		CO1 - Apply various laws of thermodynamics to various processes and real systems
		CO2 - Apply the concept of Entropy, Calculate heat, work and other important thermodynamic properties for various ideal gas processes.

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202043	Thermodynamics	CO3 - Estimate performance of various Thermodynamic gas power cycles and gas refrigeration cycle and availability in each case.
		CO4 - Estimate the condition of steam and performance of vapour power cycle and vapour compression cycle
		CO5 - Estimate Stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants.
		CO6 - Use Psychometric charts and estimate various essential properties related to Psychometric and processes
202044	Material Science	Understand the basic concepts and properties of Material.
		Understand about material fundamental and processing.
		Select proper metal, alloys, nonmetal and powder metallurgical component for specific requirement
		Detect the defects in crystal and its effect on crystal properties.
		Evaluate the different properties of material by studying different test
		Recognize how metals can be strengthened by cold-working and hot working
202051	Strength of Materials	Apply knowledge of mathematics, science for engineering applications
		Design and conduct experiments, as well as to analyze and interpret data
		Design a component to meet desired needs within realistic constraints of health and safety
		Identify, formulate, and solve engineering problems
		Practice professional and ethical responsibility
		Use the techniques, skills, and modern engineering tools necessary for engineering practice

Course Outcomes (COs) SEM-II

SE (Mechanical Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
202045	Fluid Mechanics	Use of various properties in solving the problems in fluids
		Use of Bernoulli's equation for solutions in fluids
		Determination of forces drag and lift on immersed bodies
		Understand physics of Laminar and Turbulent flow
		Identify energy losses in pipe flow
		Identification of drag and lift forces on immersed bodies
202047	Soft Skills	Improved communication, interaction and presentation of ideas.
		Right attitudinal and behavioral change
		Developed right-attitudinal and behavioral change
202048	Theory of Machines – I	Identify mechanisms in real life applications
		Perform kinematic analysis of simple mechanisms
		Perform static and dynamic force analysis of slider crank mechanism
		Determine moment of inertia of rigid bodies experimentally
		Analyze velocity and acceleration of mechanisms by vector and complex algebra method
		Analyze velocity and acceleration of mechanisms by graphical methods

202049	Engineering Metallurgy	Describe how metals and alloys formed and how the properties change due to microstructure
		Apply core concepts in Engineering Metallurgy to solve engineering problems.
		Conduct experiments, as well as to analyze and interpret data
		Select materials for design and construction
		Possess the skills and techniques necessary for modern materials engineering practice
		Recognize how metals can be strengthened by alloying, cold-working, and heat treatment
202050	Applied Thermodynamics	Classify various types of Engines, Compare Air standard, Fuel Air and Actual cycles and make out various losses in real cycles
		Understand Theory of Carburetion, Modern Carburetor, Stages of Combustion in S. I. Engines and Theory of Detonation, Pre-ignition and factors affecting detonation
		Understand Fuel Supply system, Types of Injectors and Injection Pumps, Stages of Combustion in CI Engines, Theory of Detonation in CI Engines and Comparison of SI and CI Combustion and Knocking and Factors affecting, Criteria for good combustion chamber and types.
		Carry out Testing of I. C. Engines and analyze its performance.
		Describe construction and working of various I. C. Engine systems (Cooling, Lubrication, Ignition, Governing, and Starting) also various harmful gases emitted from exhaust and different devices to control pollution and emission norms for pollution control.
		Describe construction, working of various types of reciprocating and rotary Compressors with performance calculations of positive displacement compressors.
203152	Electrical and Electronics Engineering	Understand the two basic principles (generation of force and emf) that govern electromechanical energy conversion
		Understand the operation of dc motor, Induction Motor & its speed control.
		Develop the capability to identify and select suitable DC motor / induction motor / special purpose motor
		Understand embedded platform using Arduino board
		Program Arduino IDE using conditional statements
		Interfacing sensors with Arduino IDE

Course Outcomes (COs) SEM-I

TE (Mechanical Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
302041	Design of Machine Elements-I	Ability to identify and understand failure modes for mechanical elements and design of machine elements based on strength.
		Ability to design Shafts, Keys and Coupling for industrial applications.
		Ability to design machine elements subjected to fluctuating loads.
		Ability to design Power Screws for various applications.
		Ability to design fasteners and welded joints subjected to different loading conditions.
		Ability to design various springs for strength and stiffness.

302042	Heat Transfer	Analyze the various modes of heat transfer and implement the basic heat conduction equations for steady one dimensional thermal system.
		Implement the general heat conduction equation to thermal systems with and without internal heat generation and transient heat conduction.
		Analyze the heat transfer rate in natural and forced convection and evaluate through experimentation investigation.
		Interpret heat transfer by radiation between objects with simple geometries.
		Analyze the heat transfer equipment and investigate the performance.
		Analyze the heat exchanger and design heat exchanger based on practical consideration
302043	Theory of Machines-II	Student will be able to understand fundamentals of gear theory which will be the prerequisite for gear design.
		Student will be able to perform force analysis of Spur, Helical, Bevel, Worm and Worm gear.
		The student will be able to analyze speed and torque in epi-cyclic gear trains which will be the prerequisite for gear box design.
		Student will be able to design cam profile for given follower motions and understand cam Jump phenomenon, advance cam curves.
		The student will synthesize a four bar mechanism with analytical and graphical methods.
		The student will analyze the gyroscopic couple or effect for stabilization of Ship Aero plane and Four wheeler vehicles.
302044	Turbo Machines	Apply thermodynamics and kinematics principles to turbo machines.
		Analyze the performance of turbo machines.
		Ability to select turbo machine for given application.
		Predict performance of turbo machine using model analysis.
		Understand mechanisms behind working of Turbines.
		Apply knowledge of Turbo machines to optimize the efficiencies of turbines.
302045	Metrology and Quality Control	Understand the methods of measurement and selection of measuring instruments ,standards of measurement
		Identify and apply various measuring instruments
		Explain tolerance, limits of size, fits, geometric and position tolerances and gauge design
		Recommend the Quality Control Techniques and Statistical Tools appropriately
		Analyze the Data collected
		Develop an ability of problem solving and decision making by identifying and analyzing the cause for variation and recommend suitable corrective actions for quality improvement

Course Outcomes (COs) SEM-II

TE (Mechanical Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)

302047	Numerical Methods and Optimization	Use appropriate Numerical Methods to solve complex mechanical engineering problems.
		Formulate algorithms and programming.
		Use Mathematical Solver.
		Generate Solutions for real life problem using optimization techniques
		Analyze the research problem
		To develop logical skills
302048	Design of Machine Elements-II	To understand and apply principles of gear design to spur gears and industrial spur gear boxes.
		To become proficient in Design of Helical and Bevel Gear
		To develop capability to analyze Rolling contact bearing and its selection from manufacturer's Catalogue.
		To learn a skill to design worm gear box for various industrial applications.
		To inculcate an ability to design belt drives and selection of belt, rope and chain drives
		To achieve an expertise in design of Sliding contact bearing in industrial applications.
302049	Refrigeration and Air Conditioning	Illustrate the fundamental principles and applications of refrigeration and air conditioning system
		Obtain cooling capacity and coefficient of performance by conducting test on vapour compression refrigeration systems
		Present the properties, applications and environmental issues of different refrigerants
		Calculate cooling load for air conditioning systems used for various
		Operate and analyze the refrigeration and air conditioning systems.
302050	Mechatronics	Identification of key elements of mechatronics system and its representation in terms of block diagram
		Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O
		Interfacing of Sensors, Actuators using appropriate DAQ micro-controller
		Time and Frequency domain analysis of system model (for control application)
		PID control implementation on real time systems
		Development of PLC ladder programming and implementation of real life system.
302051	Manufacturing Process-II	Student should be able to apply the knowledge of various manufacturing processes
		Student should be able to identify various process parameters and their effect on processes.
		Student should be able to design and analyze various manufacturing processes and tooling.
		Student should be able to figure out application of modernization in machining.
		Students should get the knowledge of Jigs and Fixtures so as to utilize machine capability for variety of operations.
		Students should be able to understand the CNC technology and should be able to prepare CNC program
302052	MACHINE SHOP – II	Ability to develop knowledge about the working and programming techniques for various machines and tools
		Establish motivation for any topic of interest and develop a thought process for technical presentation.

302053	Seminar	Organize a detailed literature survey and build a document with respect to technical publications.
		Analysis and comprehension of proof-of-concept and related data.
		Effective presentation and improve soft skills.
		Make use of new and recent technology (e.g. Latex) for creating technical reports

Course Outcomes (COs) SEM-I

BE (Mechanical Engineering) -2015 Pattern

Course Code	Name of Subject/ Course	Course Outcome (COs)
402041	Hydraulics and Pneumatics	Understand working principle of components used in hydraulic & pneumatic systems
		Identify various applications of hydraulic & pneumatic systems
		Selection of appropriate components required for hydraulic and pneumatic systems
		Analyse hydraulic and pneumatic systems for industrial/mobile applications
		Design a system according to the requirements
		Develop and apply knowledge to various applications
402042	CAD CAM Automation	Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations.
		Use analytical and synthetic curves and surfaces in part modeling
		Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software
		Generate CNC program for Turning / Milling and generate tool path using CAM software
		Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturing technology
		Understand the robot systems and their applications in manufacturing industries.
402043	Dynamics of Machinery	Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines
		Estimate natural frequency for single DOF undamped & damped free vibratory systems
		Determine response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.
		Estimate natural frequencies, mode shapes for 2 DOF undamped free longitudinal and torsional vibratory systems.
		Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.
		Explain noise, its measurement & noise reduction techniques for industry and day today life problems.
		Understand the different techniques used to solve mechanical engineering problems.
		Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.
		Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.

402044 A	Finite Element Analysis	Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.
		Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.
		Interpret the results of finite element analyses and make an assessment of the results in terms of modeling (physics assumptions) errors, discretization
		mesh density and refinement toward convergence) errors, and numerical (round-off) errors.
402044 C	Heating Ventilation and Air Conditioning	Determine the performance parameters of trans-critical & ejector refrigeration systems
		Estimate thermal performance of compressor, evaporator, condenser and cooling tower
		Describe refrigerant piping design, capacity & safety controls and balancing of vapour compressor system.
		Explain importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.
		Estimate heat transmission through building walls using CLTD and decrement factor &time lag methods with energy-efficient and cost-effective measures for building envelope
		Explain working of types of desiccant, evaporative, thermal storage, radiant cooling, clean room and heat pump air-conditioning systems.
Course Outcomes (COs) SEM-II		
BE (Mechanical Engineering) -2015 Pattern		
402047	Energy Engineering	Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle
		Analyze the steam condensers, recognize the an environmental impacts of thermal power plant and method to control the same
		Recognize the layout, component details of hydroelectric power plant and nuclear power plant
		Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle
		Emphasize the fundaments of non-conventional power plants
		Describe the different power plant electrical instruments and basic principles of economics of power generation.
402048	Mechanical System Design	Understand the difference between component level design and system level design.
		Design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.
		Learn optimum design principles and apply it to mechanical components.
		Handle system level projects from concept to product.
402049 B	Industrial Engineering	Apply the Industrial Engineering concept
		Understand, analyze and implement different concepts involved in method study.
		Design and Develop different aspects of work system and facilities.
		Understand and Apply Industrial safety standards, financial management practices.
		Undertake project work based on modeling & simulation area.

402050 A	Advanced Manufacturing Processes	Classify and analyze special forming processes
		Analyze and identify applicability of advanced joining processes
		Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
		Select appropriate micro and nano fabrication techniques for engineering applications
		Understand and apply various additive manufacturing technology for product development
		Understand material characterization techniques to analyze effects of chemical composition, composition variation, crystal structure, etc.